

370 STATISTICS

GRADE: 12

LEVEL: 1

CREDITS: 5

RECOMMENDED PREREQUISITE: C or better in Algebra II

BASIC TEXT: The Basic Practice of Statistics,
Moore, David S., 2007

COURSE DESCRIPTION:

This course will have students look at statistical ideas and statistical reasoning and on their relevance in such fields as medicine, education, environmental science, business, psychology, sports, politics, and entertainment. It is designed to support a first course in high school statistics that emphasizes statistical thinking. Activities and applications give students an opportunity to investigate, discuss, and make use of statistical ideas and methods.

MISSION RELATED GOALS:

This class will provide the student with a variety of opportunities to demonstrate academic excellence and intellectual curiosity by communicating effectively, solving complex problems, and working with others toward a common goal.

STUDENT EXPECTATIONS FOR LEARNING ADDRESSED:

Students will be afforded opportunities to apply mathematical concepts to real-world applications. A variety of teaching methods will be used to foster an environment that promotes self-confidence and respect for others throughout the school and global community.

GENERAL PERFORMANCE OBJECTIVES:

Students will be able to:

1. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
2. Select and use appropriate statistical methods to analyze data
3. Understand and apply basic concepts of probability

MASSACHUSETTS FRAMEWORK STRANDS:

- Number Sense
- Patterns, Relations, and Algebra
- Geometry

- Measurement
- Data Analysis, Statistics, and Probability

MASSACHUSETTS FRAMEWORK STANDARDS:

- I. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. (10.M.4)
- II. Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties. (10.N.1)
- III. Simplify numerical expressions, including those involving positive integer exponents or the absolute value and apply such simplifications in the solution of problems. (10.N.2)
- IV. Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers (10.N.4)
- V. Describe, analyze, and generalize a wide variety of patterns. (10.P.1)
- VI. Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope. (10.P.2)
- VII. Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms; factoring; identifying and canceling common factors in rational expressions; and applying the properties of positive integer exponents. (10.P.4)
- VIII. Solve everyday problems that can be modeled using linear, quadratic or exponential functions. (10.P.7)
- IX. Select, create, and interpret an appropriate graphical representation (e.g., scatterplot, table, stem-and-leaf plots, box-and-whisker plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data.(10.D.1)
- X. Approximate a line of best-fit (i.e. trend line) given a set of data. (10.D.2)
- XI. Describe and explain how the relative sizes of a sample and the population affect the validity of predictions from a set of data. (10.D.3)
- XII. Design surveys and apply random sampling techniques to avoid bias in the data collection. (12.D.1)
- XIII. Select an appropriate graphical representation for a set of data and use appropriate statistics (e.g., quartile or percentile distribution) to communicate information about the data. (12.D.2)
- XIV. Apply regression results and curve fitting to make predictions from data. (12.D.3)
- XV. Apply uniform, normal, and binomial distributions to the solutions of problems. (12.D.4)
- XVI. Describe a set frequency distribution data by spread (i.e., variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications. (12.D.5)
- XVII. Compare the results of simulations (e.g., random number tables, random functions, and area models) with predicted probabilities. (12.D.7)

UNITS AND THEMES:

I. Exploring Data: Variables and Distributions	10.M.4,10.D.1
II. The Normal Distributions	10.N.1,10.N.2,10.N.4,10.P.4,10.P.7 12.D.4,12.D.5
III. Exploring Data: Relationships	10.N.1,10.N.2,10.N.4,10.P.2,10.P.7, 10.D.1,10.D.2,12.D.3,12.D.5
IV. Producing Data: Sampling	10.M.4,10.P.1,10.D.1,10.D.2,10.D.3, 12.D.1,12.D.2,12.D.5
V. Producing Data: Experiments	10.P.1,10.D.1,10.D.2,10.D.3,12.D.2, 12.D.5
VI. Introduction to Probability	10.N.1,10.N.2,10.N.4,10.P.1,10.P.7, 10.D.1,12.D.2,12.D.5
VII. General Rules of Probability	10.D.1,10.D.2,12.D.2,12.D.5

COURSE OUTLINE

I. Exploring Data: Variables and Distributions (10 days)	10.M.4,10.D.1
a. Graphs, Good and Bad	
b. Picturing Distributions with Graphs	
c. Picturing Distributions with Numbers	
II. The Normal Distributions (10 days)	10.N.1,10.N.2,10.N.4, 10.P.4,10.P.7,12.D.4, 12.D.5
a. Normal Distributions	
b. Confidence Intervals (95%)	
c. The Consumer Price Index and Government Statistics (Stats through Applications book)	
III. Exploring Data: Relationships (10 days)	10.N.1,10.N.2,10.N.4, 10.P.2,10.P.7,10.D.1, 10.D.2,12.D.3,12.D.5
a. Scatterplots and Correlation	
b. Regression, Prediction, Causation	
IV. Producing Data: Sampling (15 days)	10.M.4,10.P.1,10.D.1, 10.D.2,10.D.3,12.D.1, 12.D.2,12.D.5
a. Observation vs experiment	
b. Sampling	
c. Sampling badly	
d. Simple random samples	
e. Other sampling designs	
f. Cautions about samples	
g. Inference about the population	
V. Producing Data: Experiments (15 days)	10.P.1,10.D.1,10.D.2, 10.D.3,12.D.2,12.D.5
a. Experiments	
b. Experimenting badly	
c. Randomized comparative experiments and their logic	
d. Cautions about experimenting	
e. Data Ethics	

- | | |
|---|--|
| <p>VI. Introduction to Probability (14 days)</p> <ul style="list-style-type: none"> a. Idea of probability b. Probability models c. Probability rules d. Discrete probability models e. Continuous probability models f. Random variables g. Personal probability | <p>10.N.1,10.N.2,10.N.4,
10.P.1,10.P.7,10.D.1,
12.D.2,12.D.5</p> |
| <p>VII. General Rules of Probability (12 days)</p> <ul style="list-style-type: none"> a. Independence and the multiplication rule b. The general addition rule c. Conditional probability d. The general multiplication rule e. Independence f. Tree diagrams | <p>10.D.1,10.D.2,12.2.2,
12.D.5</p> |
| <p>VIII. Review, Midterm, Final (4 days)</p> | |

SUGGESTED INSTRUCTIONAL STRATEGIES:

1. Lecture
2. Written Exercises
3. Group Work
4. Projects
5. Use of Manipulatives
6. Use of a Variety of Questioning Techniques
7. Board work
8. Calculator Activities
9. Games (Math Jeopardy, etc.)
10. Student Presentations
11. A variety of assessment tools (partner quizzes, etc.)

USE OF TOOLS/TECHNOLOGY:

1. Use of TI-83 (Plus/Silver Edition) calculators providing the students with step by step instructions including screen shots for performing important statistical functions
2. Exploring the web, highlighting some useful sites connected to the material in each section
3. Overhead projector and transparencies, SMARTboard

ASSESSMENT TECHNIQUES:

1. Students will take free-response and multiple choice performance tests
2. Students will answer questions orally
3. Students will work in cooperative groups and report their results
4. Students will participate in classroom discussions

5. Students will prepare integrated projects
6. Homework evaluation